Claims

1. A method of stimulating an immune response in a subject to an antigen, comprising the step of administering a binding agent, which binds a surface receptor of an antigen-presenting cell, and an antigen, to which the immune response is targeted, in a pharmacologically acceptable medium to the subject, whereby the antigen is targeted to the receptor of the antigen-presenting cell.

2. The method of claim 1 wherein the binding agent binds the surface receptor of the antigen-presenting cell without being blocked substantially by the natural ligand for the surface receptor.

3. The method of claim 1, wherein the antigen is coupled to the binding agent.

4. The method of claim 1, wherein the binding agent is an antibody, or fragment thereof comprising at least one complementarity determining region.

5. The method of claim 1, wherein the binding agent is bispecific, having a binding affinity for the receptor and for the antigen.

6. The method of claim 4, wherein the bispecific binding agent is selected from the group consisting of heteroantibodies, bispecific antibodies, and bispecific molecules.

7. The method of claim 1, wherein the antigen is selected from the group consisting of viral, bacterial, parasite, allergen, venom, and tumor-associated antigens.

8. The method of claim 7, wherein the antigen is derived from hepatitis virus.

9. The method of claim 7, wherein the antigen is an HIV antigen.

10. The method of claim 1, wherein the surface receptor is selected from the group consisting of FcγRI, FcγRII, and FcγRIII.

11. The method of claim 1, wherein the antigen-presenting cell is a macrophage.

12. The method of claim 1 wherein the administering step comprises administering the binding agent and the antigen as a molecular complex,

the binding agent being a bispecific antibody, heteroantibody, or bispecific molecule including:

(i) a first antibody, or fragment thereof, which specifically binds the Fc receptor for immunoglobulin G (IgG) on the macrophage surface without being blocked substantially by IgG; and

(ii) a second antibody, or fragment thereof, which specifically binds the antigen.

13. The method of claim 12, wherein the heteroantibody comprises an Fab-Fab conjugate.

14. A method of treating hepatitis B infection comprising administering to an individual infected with the virus a molecular complex comprising:

(a) a hepatitis B surface antigen, or surface-exposed portion thereof; and

(b) an Fab-Fab heteroantibody, wherein the first Fab binds the high affinity Fc receptor for immunoglobulin G without being blocked substantially by IgG, and the second Fab binds the antigen.

15. A molecular complex comprising:

(a) an antigen; complexed to

(b) a binding agent which binds a surface receptor of an antigen-presenting cell.

16. The molecular complex of claim 15 wherein the binding agent binds a surface receptor of an antigen-presenting cell without being blocked substantially by the natural ligand for the receptor.

17. The molecular complex of claim 15, wherein the binding agent is selected from the group consisting of a monoclonal antibody, a heteroantibody, a bispecific antibody, and a bispecific molecule.

18. The molecular complex of claim 15 wherein the binding agent is chemically coupled to the antigen.

19. The molecular complex of claim 15 wherein the binding agent is peptide-linked to the antigen, the molecular complex produced by recombinant DNA techniques.

20. The molecular complex of claim 15, wherein the antigen is selected from the group consisting of viral, bacterial, parasite, allergen, venom, and tumor-associated antigens.

21. The molecular complex of claim 20, wherein the antigen is a hepatitis antigen.

22. The molecular complex of claim 20, wherein the antigen is an HIV antigen.

23. The molecular complex of claim 20, wherein the antigen is selected from the group consisting of bee venom, pollen, and dust mite antigen.

24. The molecular complex of claim 15, wherein the antigen-presenting cell is a macrophage.

25. The molecular complex of claim 15, wherein the surface receptor is a receptor on a macrophage selected from the group consisting of FcγRI, FcγRII, and FcγRIII.

26. The molecular complex of claim 25, wherein the surface receptor is the high affinity FcγRI for immunoglobulin G on a macrophage.

27. The molecular complex of claim 20 wherein the antigen comprises an allergen which binds to IgE on mast cells and basophils, thereby causing a type I hypersensitivity reaction, and the bispecific binding agent is a heteroantibody that binds the high affinity Fc receptor without being blocked by IgG binding to the receptor.

28. The molecular complex of claim 15 wherein the binding agent comprises an antibody fragment including at least one complementarity determining region

29. The method of claim 28 wherein the antibody fragment is selected from the group consisting of Fab, Fab', and Fv fragments.

30. The molecular complex of claim 28 wherein the binding agent comprises an Fab-Fab heteroantibody, the first Fab binding the Fcγ receptor for immunoglobulin G (IgG) without being blocked by IgG, and the second Fab binding the antigen.

31. The molecular complex of claim 30 wherein the first Fab binds the FcγRI.

32. A vaccine composition comprising the molecular complex of claim 15 in a pharmaceutically acceptable medium.

33. A binding agent specific for an Fcγ receptor, incorporated into a carrier for targeting antigen to an FcγR-expressing cell, the carrier including the antigen.

34. The binding agent of claim 33, wherein the carrier is a liposome having an inner layer and an outer layer and containing an antigen within the liposome, the binding agent being incorporated into the outer layer of the liposome.

35. The binding agent of claim 33 which is an anti-Fc receptor antibody selected from the group consisting of an anti-FcγRI antibody, an FcγRII antibody, and an FcγRIII antibody.

36. The binding agent of claim 35 comprising an anti-FcγRI antibody.

37. The binding agent of claim 33 wherein the carrier contains an antigen selected from the group consisting of viral, bacterial, parasite, allergen, venom, and tumor-associated antigens.

38. A bispecific antibody that is reactive with a surface receptor selected from the group consisting of FcγRI, FcγRII, and FcγRIII.

39. A method of depleting antigen in the circulation of a subject comprising the step of administering to the subject the bispecific antibody of claim 38 in a pharmacologically acceptable medium.

40. A method of decreasing hypersensitivity in a subject comprising the step of administering a molecular complex in a pharmacologically acceptable medium to the circulation of a patient in an amount sufficient to induce an immune response in the subject, the complex comprising:

(i) an allergen which binds to IgE on mast cells and basophils, thereby causing a type I hypersensitivity reactions; complexed to

(ii) a binding agent selected from the group consisting of a heteroantibody, bispecific antibody, and monoclonal antibody, the binding agent binding the high affinity Fc receptor without being blocked by IgG binding to the receptor.